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ON THE ROCKS NEAR PHILADELPHIA.

BY THEO. D. RAND.

In pursuit of the study of Mineralogy I have become somewhat acquainted with the rock formations near Philadelphia, and have thought some of the observations of sufficient interest for publication, that others, possessing more knowledge, may apply them towards a solution of the geology of the region. Specimens of many of the rocks to which I refer will be found in the collection recently given to the Academy. I have endeavored to trace the rocks along their outcrop, and will consider them in their order at the Schuylkill, beginning at Gray's Ferry.

From that point to Girard Avenue Bridge, Mica Schists with beds of gneiss occur—the gneiss including granitic veins and the following minerals: Muscovite, Orthoclase, Albite, Tourmaline, Garnet, Beryl, Lime Uranite, Copper Uranite, and Sulphide of Bismuth (Bismuthinite). This is most fully developed at Fairmount. There is a striking resemblance between these rocks and those of the vicinity of Chester, Delaware Co., in which all the above minerals occur, except the Bismuthinite. Carbonate of Bismuth, Bismutite, however, does occur.

On the west bank of the river above Girard Avenue is a mass of coarse granite, in which the characteristic minerals are Muscovite and Biotite intercrystallized. A similar granitic rock appears at several points along the ridge west of the creek known as Mill Creek, in the vicinity of 44th Street, West Philadelphia, and particularly at a point on the Baltimore turnpike in the same vicinity, as observed by Prof. Kœnig and Mr. H. C. Lewis.

Above the Columbia Bridge there is a peculiar gneiss of a reddish color, and near by efflorescences of Halotrichite. More abundant is a hornblendic gneiss at South Laurel Hill.

This belt appears to cross Belmont Avenue above George's Hill, and the Penna. R.R., about half way between 52d Street and Overbrook. A deep cutting exposes the rock, which there abounds in Pyrites, and which in part is very compact. Much of this rock completely decomposes within two or three years after exposure.

At the Falls, a belt of very hard porphyritic gneiss crosses the river, forming the N. W. flank of Laurel Hill, and the S. E. bank of the river, and seems to have caused the abrupt bend at this point. This belt is very narrow at the Schuylkill, only from one hundred to two hundred feet in width, but it widens as it goes southwestward. The lower edge is crossed by the Pennsylvania Railroad less than a quarter of a mile from the rocks last described, the upper at Elm Station, six miles from the city—a distance along the railroad of nearly two miles, but across the strike probably about one and a quarter. This rock is so hard that its outcrop can be almost continuously traced.

At Flat Rock Tunnel, on the Schuylkill, seven miles above Fairmount, a bed of hard mica schists and gneiss crosses the river—this is probably the continuation of the beds so largely wrought for building stone at Frankford, and crossing Wayne Street, Germantown, near the railroad, and the Wissahickon at McKinney's quarry, there causing the abrupt bend in the stream. The minerals of this belt are particularly zeolites, chiefly Stilbite, also Muscovite, Biotite, Orthoclase, Albite, Sphene, Calcite, Apatite, Epidote, Copper Pyrites, Chrysocolla, etc., and Molybdenite. The quarries at Frankford having been most extensive, all these minerals have been found there, nearly all of them at McKinney's, and only the Zeolites, Calcite, Muscovite, Orthoclase, and Albite at the Tunnel. The identity of the rock to McKinney's is, I think, unquestionable, and the continuation at the Tunnel probable.

About two miles above, passing mica schists, sometimes filled with garnets, we reach the well-known Soapstone belt, which extends in a straight line, most clearly marked, from a point on the west flank of Chestnut Hill, about S. 54° W. This belt was supposed to dip under, near Merion Square, at the "Black Rocks," but Prof. Booth called my attention to its appearance at Rosemont Station, Penna. R.R., ten miles from Philadelphia. Its characteristic rock is the so-called bastard soapstone, a paste of Steatite, filled with irregular masses, and occasionally crystals, of Serpentine, probably, as I have heretofore shown, pseudomorphic after Staurolite. This same rock, with the cystals well defined, I have observed on the road from Philadelphia to West Chester, ten and a half miles from Philadelphia, the belt in which Moro Phillips' Chrome mine has been opened.

West of this, at the Schuylkill, and apparently on the S. W. bank only, is a bed of slaty serpentine, very dark olive-green, and sometimes almost black in color, associated with a mineral resembling Schiller Spar, and also an almost unaltered hornblendic mineral, apparently Enstatite. This belt is narrow, but very well defined, with frequent outcrops. It cuts diagonally, but at a very small angle, the rocks next described, and continues in a course W. 5° N., on their north flank, and is almost without doubt continuous with the well-known belt just north of West Chester. Its outcrop is frequently marked by cellular quartz with cavities lined with crystals, and stained by oxide of iron. At one point, one-quarter mile S. W. of Radnor Station, Penna. R.R., twelve miles from Philadelphia, at the side of an old quarry, the mode of formation of this rock from the Serpentine is shown in a remarkable manner. At the bottom, the serpentine is almost unaltered, above, cracks are seen extending through it in various directions, but usually one series nearly parallel and more or less at right angles to another, higher still; these cracks are seen to contain films of quartz, which become thicker and thicker, while the inclosed serpentine is softer and more rusty in color, until, near the top, the cells have thick walls, and contain only a small amount of what appears to be oxide of iron, and in part are empty. Well waters in the vicinity contain magnesia and iron, and sulphuric and silicic acids.

At Spring Mills, a bed of gneiss and granite, or granitoid gneiss crosses the Schuylkill. These are very hard rocks, and form the highest summits of the table-land, of which they form the N.W. boundary. The stratification is nearly vertical, and the characteristic mineral is a bluish quartz, which weathering out of the rock is everywhere visible in the roads. Taking this as a criterion, these rocks extend from above Van Arsdalen's quarry, in Bucks Co., at least to Darby Creek. The gneiss is often hornblendic, sometimes porphyritic, and generally composed of thin layers of alternately light and dark material. It seems entirely destitute of granitic veins or of crystalline minerals, except those composing the mass of the rock quartz feldspar—probably both orthoclase, and a triclinic feldspar, hornblende and mica.

At the Schuylkill, immediately northwest of this, is a small limestone valley, and then the continuation of the Edge Hill rocks. On the northeast side of this valley stretches a narrow dyke of trap almost continuously exposed for many miles, crossing the Schuylkill at Conshohocken, and the Penna. R.R. and the Lancaster turnpike at Wayne, thirteen miles from Philadelphia: there is also an exposure of trap in a cutting of the Pennsylvania R.R. through the granitic belt northeast of Radnor Station. This is not in line with any other trap dyke of which I have knowledge.

The Edge Hill rocks form a ridge at the Schuylkill not over a quarter of a mile in width, but rapidly widening, until between Radnor Station and the King of Prussia they are over a mile and a half wide. They are composed of talc-like schists, but are probably hydro-mica schists, in nearly vertical strata, with beds of quartz with cavities which appear to have contained pyrites, much resembling the auriferous quartz of the Eastern United States. This ridge or table-land, which is quite steep in its slopes, forms the southeast boundary of the Chester Valley.

A remarkable feature of the part of Montgomery Co. and Chester Co. bordering on the Schuylkill is the direction taken by the streams. The general features are high hills extending in a N.E, and S.W. direction with deep limestone valleys between, nearly at right angles to the general course of the Schuylkill. The streams, however, do not follow the valleys. The Wissahickon leaves the Montgomery Co. valley and flows eastwardly through a deep narrow gorge through very hard rocks a distance of over five miles. The Valley Creek flows down the Chester Valley and then turns abruptly westwardly and flows through the N.W. boundary hill. The Gulf Creek flows down the valley two or three miles, then turns westwardly and flows through a deep and narrow gorge into another valley on the west, with banks rising abruptly two or three hundred feet.